

MINISTRY OF COMMERCE AND INDUSTRY



REPORT
OF THE
COMMITTEE
ON

MILK POWDER INDUSTRY

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TABLE OF CONTENTS

CHAPTER	PAGES
Introduction	i—ii
Chapter I Imports of dried and evaporated milks during 1952—57	1—5
Chapter II Steps taken to develop milk powder and condensed milk industry in India	6—13
Chapter III Essential requirements of milk drying or milk condensing industry and scope for development in India	14—20
Chapter IV Present position of the dried, concentrated and malted milk industry in India	21—26
Chapter V Plant and machinery required for condensed and dried milks and the scope for indigenous manufacture of such machinery	27—32
Chapter VI Summary and recommendations of the Committee	33—38
APPENDIX	
Govt.'s resolution on the Report	39—41



1. INTRODUCTION

The Government of India appointed a Committee to review the development of milk powder industry in India *vide* Commerce & Industry Ministry No. 19(3)/57-C-D.(A)(MCI), dated the 19th February, 1957. The Committee consisted of the following:—

Chairman

- (i) Shri Krishan Chand, I.C.S., Joint Secretary, Ministry of Food & Agriculture (Department of Agriculture).

Members

- (ii) Dr. L. C. Sikka, Dairy Development Adviser, Ministry of Food & Agriculture, (Department of Agriculture).
- (iii) Shri T. R. Sathe, Special Officer, Ministry of Commerce & Industry.

Member-Secretary

- (iv) Shri V. A. Mehta, Deputy Development Officer (Food), Ministry of Commerce & Industry.

As Shri T. R. Sathe resigned his post subsequently, the report has been signed by the remaining three members.

2. *Terms of reference.*—The terms of reference of the Committee were

- (i) To review the steps so far taken to develop the milk powder industry in India in the private and public sectors and also under the auspices of the UNICEF.
- (ii) To assess the scope for further development of the production of milk powder in India having regard to the present and potential availability of fluid milk and to suggest suitable locations for this purpose.
- (iii) To assess (a) present import; (b) indigenous production and (c) consumption of milk powder in India for different purposes.
- (iv) To make recommendations regarding the nature of plant and machinery required for the manufacture of milk powder keeping in view the present foreign exchange position and to examine the scope for the fabrication of roller and spray milk drying plants in India in the near future.
- (v) To make such other recommendations that the Committee may deem appropriate having regard to the objective of developing the production of milk powder in India.
- (vi) The Committee may also make an enquiry on the above lines in regard to condensed milk.

3. *Meetings.*—The first meeting of the Committee was held on the 21st December, 1957, when the general plan of work was discussed. The Committee decided to issue questionnaires for eliciting information from (a) private industrialists and cooperative organisations, who had evinced interest in the development of milk powder/condensed milk industry in India, (b) fabricators of industrial machinery, who might be interested in the indigenous manufacture of plant and equipment required for producing milk powder or condensed milk, and (c) State Governments regarding the progress of their schemes and location of surplus 'milk pockets' in their jurisdiction considered suitable for the establishment of additional milk powder or condensed milk factories. The second meeting of the Committee was held on the 7th January, 1958, when it approved the draft questionnaires and reviewed the position regarding establishment of milk powder factories included in the public sector in the Second Five Year Plan. The third meeting of the Committee was held on the 14th February, 1958, when a draft outline of the report was considered. As the response to the questionnaires was considered unsatisfactory, the Committee decided to extend the date for receipt of replies till February 28, 1958. The fourth meeting was held on the 3rd March, 1958, when the replies received were considered. The Committee met again at Bombay on the 12th and 13th May, and at Ahmedabad and Anand on the 14th and 15th May, 1958 respectively, to study the working of the Bombay and Ahmedabad Milk Schemes and the Kaira District Cooperative Milk Producers' Union Ltd., Anand. When in Bombay, the Committee also, visited Glaxo Laboratories Ltd. and discussed their programme for the manufacture of milk food for infants at Aligarh. Thereafter, the Committee arrived at the main conclusions and directed that the draft report be prepared in the light of these conclusions. The draft report was considered at the 6th and final meeting of the Committee held on 2-12-58 when it was adopted and signed.

4. *Plan of the Report.*—We have divided our report into six separate chapters. In the first chapter, the imports of dried and evaporated milks during the period 1952-53 to 1957-58 have been examined to get an estimate of the country's needs of these products. In chapter 2, steps taken in the past to develop milk powder industry in India have been reviewed. Chapter 3 details the essential requirements of a milk drying or milk condensing industry and discusses how far these requirements are satisfied in the country, at present. In chapter 4, the present position of milk drying and milk condensing industry in the light of the development envisaged during the Second Five Year Plan has been outlined. Chapter 5 deals with the requirements of plant and machinery and the scope for their manufacture indigenously. Chapter 6 gives the summary and Committee's recommendations for the development of dried milk and evaporated milk industries.

CHAPTER I

IMPORTS OF DRIED AND EVAPORATED MILKS 1952-1957

India consumes a variety of dried, condensed and malted milk products, which due to lack of indigenous production are almost entirely imported. Depending upon their mode of manufacture, composition and use, these products are grouped under the following heads of purposes of trade, tariff and import control:—

- (i) Dried milks
 - (a) whole milk powder.
 - (b) skim milk powder.
- (ii) Patent foods
 - (a) milk foods for infants and invalids.
 - (b) other sorts.
- (iii) Condensed and evaporated milks
 - (a) evaporated whole.
 - (b) evaporated skim.
 - (c) sweetened condensed whole.
 - (d) sweetened condensed skim.

U.S.A., U.K., the Netherlands, New Zealand, Australia, Denmark, Belgium and Sweden are the more important manufacturers of one or more of these products.

The annual imports of dried and partially-dried milk products during the five year period from 1952-53 to 1956-57 are shown below:

Products	Quantity—long tons					Value—Rs. in lakhs				
	1952-53	1953-54	1954-55	1955-56	1956-57	1952-53	1953-54	1954-55	1955-56	1956-57
Dried whole milk	419	1,244	1,244	5,323	2,712	18.12	39.20	41.15	100.97	64.36
Dried skim milk	9,562	17,832	27,372	28,092	34,021	205.84	289.66	338.10	391.23	503.62
Milk foods for infants and invalids	2,404	4,532	2,657	3,017	3,651	109.13	203.38	125.23	163.99	198.52
Other milk foods	941	2,200	1,623	2,255	563	33.70	91.90	67.20	113.64	90.02
Evaporated/condensed whole milk	1,855	4,200	5,843	4,593	3,721	52.70	96.52	107.43	92.11	75.77
Evaporated/condensed skim milk	478	1,116	649	332	555	7.26	13.16	7.61	4.04	7.26

It will be seen that imports of all the products were much lower in 1952-53 than in subsequent years. This was largely due to the stringent Import control policy adopted that year, when the import quotas for purposes of licensing were fixed at only 20-25 per cent for different products. The imports thereafter, except for dried skim milk, varied in an erratic manner, even though the import policy, which was liberal, remained fairly uniform—the import quotas were fixed at 100 per cent. during 1953 and 1954, licensing was liberal during 1955, 100 per cent during the first-half of 1958 and 80 per cent during the second-half. It is, therefore, difficult to explain the large differences between the volume of annual imports of milk products other than dried skim milk during the period 1953-54 to 1956-57, unless these are due to carry over of stocks from one year to the other. Consequently, it is not possible to determine the normal annual imports of these products with any great measure of accuracy. But for the purpose of this report, the following, which approximate the average for the three-year period 1953-55, may be taken as a fair estimate:—

	Quantity long tons
Dried whole milk	3,000
Milk foods for infants and invalids	3,500
Other milk foods	2,000
Evaporated/condensed whole milk	5,000
Evaporated/condensed skim milk	700

The increase in the annual imports of dried skim milk, on the other hand, has been regular and phenomenal—the imports increased four-fold within a brief period of five years. Several factors have been responsible for this. Briefly stated these are (i) the scarcity of milk and consequently its high price in most urban areas, (ii) the relatively much lower price at which dried skim milk is available from overseas, (iii) the liberal import policy allowing duty-free imports and (iv) free supplies of large quantities by UNICEF and American Voluntary Agencies. All these have resulted in a great increase in the use of this product and it is thought the increase would have continued in future, if the liberal import policy could be maintained.

The available statistics for imports of dried skim milk do not distinguish between the quantity imported by normal trade channels from that supplied free by UNICEF, American Voluntary Agencies and others. This makes it very difficult to arrive at an accurate estimate of the commercial imports.

The more important of the free supplying organisations—UNICEF and CARE—were, therefore, asked if they could supply information regarding the quantity supplied by each. While the Area Chief, UNICEF could furnish the required information, the CARE authorities were unable to do so. The annual imports, excluding the quantity supplied by UNICEF, were as follows:—

Year	Total imports Tons	UNICEF supplies Tons	Balance Tons
1952-53	9,562	2,679*	6,883
1953-54	17,832	4,018*	13,814
1954-55	27,372	9,018*	13,354
1955-56	28,092	4,039*	24,003
1956-57	34,021	9,509*	24,512

An approximate estimate of commercial imports may also be attempted by deducting from the total exports the quantity imported from U.S.A. and Canada. This is because almost the entire quantity originating from these countries was supplied free by UNICEF and others, while imports from the rest of the world were made more or less through normal trade channels. The imports from each country are shown below:—

	1952-53	1953-54	1954-55	1955-56	1956-57
	Tons	Tons	Tons	Tons	Tons
U.S.A.	24·25	1131·00	3534·55	8004·10	5455·55
Canada	367·25	58·35	241·30	30·30	1242·40
Australia	1426·30	2889·10	8311·40	8485·85	10250·50
New Zealand	2215·75	1841·80	4916·50	9083·80	6259·80
Sweden	0·55	1962·75	468·80	6·00	..
Denmark	117·50	811·75	477·30	25·00	827·70
Germany (West)	100·95	128·40	1107·70	5·00	2834·00
The Netherlands	5234·45	6901·45	5148·00	2176·15	4127·40
Rest other than U.S.A.	5·60	38·55	467·85	137·80	112·05
Total of all countries other than U.S.A. & Canada	9171·20	16642·65	23595·95	20057·25	27347·35
U.S.A. & Canada	391·50	1189·35	3775·85	8034·40	6697·95
GRAND TOTAL	9562·70	17832·00	27371·80	28091·65	34045·30

*The figures are really for calendar years 1952—1957 and not for financial years 1952-53 to 1956-57. These have been used in the absence of figures for financial years which may have introduced an element of error.

These figures are all higher than the comparable figures arrived at previously, except for the year 1955-56. But it is not possible to say what the differences are due to except that these may have resulted to some extent by the use of figures relating to calendar years instead of financial years in case of imports by UNICEF. Even if the lower figure is accepted in each case, it is obvious that nearly 20,000 tons of dried skim milk was imported by trade during 1955-56 and 24,000 tons during 1956-57. It is doubtful, if the demand had reached the saturation point even at that level of imports and would not continue to grow if supplies are freely available—so great is the shortage of fresh milk in large consuming centres.

Dried skim milk generally does not contain more than 1 per cent. of butter fat and the product containing upto 4 per cent. Imports of dried partially skimmed milk: butter fat is permitted to be imported free of customs duty at present. Imports on private account are, however, not allowed in the city of Bombay, the Bombay Milk Scheme run by the State Government, enjoying a complete monopoly in the import and sale of the product. This has led to the import by private trade of a special product containing 5 per cent butter fat to circumvent the control regulations imposed on the normal product. The exact volume of such imports is, however, not known and is included in the figures reported earlier.

Generally speaking, the consumption of milk products under consideration in any area is more or less inversely proportional to the indigenous production of milk. As the production is generally very low in the eastern and southern regions of the country, the bulk of milk powder, both whole and skim, patent milk foods, evaporated, condensed malted milks are consumed in these regions, Calcutta and Madras being the two important trade centres for this purpose.

The State-run urban milk supply schemes and the Military Dairy Farms require about 4,000 tons of dried skim milk annually for the manufacture of "blended" and "toned" milk from Demand from Government buffalo milk. These requirements are likely to increase in years to come as a result of the expansion of existing projects and the establishment of new ones included in the Second Five Year Plan.

The annual imports of evaporated milk for governmental use approximate to 2,000 tons.

In the absence of a better estimate, the present day annual requirements of dried and evaporated milk products may be taken Normal requirements of milk products as

	Quantity—long tons
Whole milk powder	3,000
Milk foods for infants and invalids	3,500

Other milk foods	2,000
Skim milk powder	24,000
Evaporated/condensed whole milk	5,000
Evaporated/condensed skim milk	700

The total value of these products at the prevailing prices is estimated at Rs. 6 crores.

It should be noted, however, that the demand for dried and evaporated milk products must, by and large, depend upon the availability of fresh milk of good quality. To the extent good, fresh milk is available, the demand for the manufactured products would diminish and *vice versa*. In the context of dairy development schemes envisaged under the Second Five Year Plan, which aim to make available more and better milk, these figures should, therefore, not be taken too rigidly. These only illustrate our requirements in the past which are likely to go down as supply and quality of fresh milk improves in future years.



CHAPTER II

STEPS TAKEN TO DEVELOP MILK POWDER AND CONDENSED MILK INDUSTRY IN INDIA

The first attempt for developing an indigenous milk drying/condensing plant was the provision of a small condensing unit at Anand in 1925 to carry out small-scale trials using buffalo milk as base. Doubt was expressed about the wisdom of opening a creamery for this purpose and the Government of India invited Dr. N. C. Wright, Director, Hannah Dairy Research Institute, Scotland in 1935-37 to report *inter alia* on the project. Dr. Wright advised that it should be abandoned. His recommendation in this regard is reproduced below which was accepted:—

“If condensing and drying factories are ultimately to be built in India they should, I believe, be erected by the firms who have long experience of the trade and established Indian market for their products. I consider, therefore, that any official assistance which may be given should be in the direction of surveying the available supplies of milk, examining their quality and determining on a small-scale the suitability of the milk for processing. These are the three primary requisites on which any commercial firm would need to have accurate information for giving serious consideration to the establishment of a condensing or drying factory in India.”

With the outbreak of the Second World War, a new situation arose inasmuch as imports of milk products ceased. The already serious problem of large consuming centres like Bombay and Calcutta, mainly dependent upon such imports, was substantially accentuated. An enterprising company, namely Messrs National Nutrionents Ltd., took up the manufacture of proprietary milk food for infants called 'vita milk'. They imported three roller drying plants manufactured by Messrs. James Bell (PTY) Ltd., Melbourne, Australia, two of which were installed at Dum Dum near Calcutta and Banaras. The third plant was located in what is now East Pakistan. The impact on war-time economy can be gauged by the fact that soon after the end of the war, the plants had to be closed down as they could not compete with the imported products, which became once more available on the cessation of hostilities.

The Military Dairy Farms Department also took up the manufacture of evaporated milk in 1945. Two plants set up for the purpose at

Lahore and Okara have both gone to Pakistan as a result of the partition.

The Khadi Pratisthan, a charitable organisation started the manufacture of sweetened condensed milk in West Bengal. Even on a cottage industry basis it did quite well while the war lasted, but it met the fate of Messrs. National Nutrionents Ltd., as it could not face either from the point of view of quality or cost to the consumer competition with the imported article.

The Policy Committee on Agriculture, Forestry and Fisheries, set up by the Government of India, at its meeting held in Simla in June 1944, recommended that a Sub-Committee should be appointed to suggest how the production of (a) milk and (b) fish may be increased. The Milk Sub-Committee was, therefore, constituted in August, 1944, which made the following recommendations regarding the manufacture of milk powder and condensed milk:—

“There are areas in India where milk is abundantly produced, but owing to transport difficulties and the inaccessibility of such ‘milk pockets’, the milk cannot be transported in fluid condition to the consuming centres. The Committee felt that if such milk can be converted into products like milk powder or condensed milk on the spot by establishing factories for this purpose, it will not only provide a more lucrative market to the cattle owners for their milk but the supply of such products can help in making up the deficit in fluid milk supply and that they can come within the reach of the man of average means”.

The Committee, therefore, recommended that:—

- (i) Government should encourage the development of this industry (manufacture of milk powder and condensed milk) in every way possible;
- (ii) the Government should immediately take the initiative in the matter and carry out exploratory work in the manufacturing process of such products to provide help and guidance to the trade; and
- (iii) Government should establish a properly-equipped centre where men required by the trade can be efficiently trained besides solving the problems facing the trade.

In 1945, the Government of India asked Sir H. JePhcott, Managing Director of Messrs. Glaxo Ltd., to advise them on the scope for the development of milk drying/condensing industry in the country. Sir Henry,

while repeating the recommendation of Dr. Wright, which has already been referred to, recommended as follows:—

- “(i) A careful study of the methods adopted by the Military Dairy Farms for the production of clean milk and for the manufacture of evaporated milk with the object of placing on record the accumulated experience which has been acquired and its utilisation elsewhere.
- (ii) That, in the light of the information so obtained, detailed consideration be given to the long term policy for the improvement, both in quality and quantity, of milk production.
- (iii) That in conjunction with the Military authorities early consideration be given to the post-war maintenance and use of Military Dairy establishments which become surplus to Military needs.
- (iv) That a detailed survey and assessment of the milk supply in certain areas be made with a view to its better utilisation probably as evaporated milk.
- (v) That the manufacture of evaporated condensed and dried milk be subject to licence to prevent the possibility of manufacture to the detriment of urban milk supplies and to prevent the wastage of money and efforts by the production of unsatisfactory products”.

Broadly speaking, he recommended that manufacture of evaporated milk should be preferred to that of sweetened condensed milk and roller-dried milk in preference to spray-dried milk.

The Directorate-General of Industries and Supplies, Ministry of Industry and Supply appointed Food Industries Panel No. 1 to report on the Milk Powder Industry in India. The report of the Panel, which was published in 1950, recommended *inter alia*:

- “(i) As nearly 60 per cent of milk is processed for ghee, there is ample scope for milk powder industry, without reducing the consumption of fluid milk. The production of ghee by the creamery method is, in fact, the very basis for the production of milk powder for utilising a bye-product now tending to be wasted in some part.
- (ii) The industry will create its own supply of milk, when a steady demand is provided from a factory.
- (iii) There are areas, particularly, pastoral areas, where the supply of milk is beyond the needs of people.

- (iv) There is, therefore, scope for the milk powder industry, provided its location is determined by reference to the availability of milk.
- (v) A milk map of India should be prepared immediately, so that surplus areas are discovered. But on the information available to the Panel, it thought that there was scope for setting up at least 9 factories in different parts.
- (vi) The Governments, both Central and States, should help the prospective factories in certain ways, such as guaranteeing a minimum offtake at agreed prices for use in schools, jails, hospitals, etc; exemption from duty of machinery required; facilitating transport of milk; providing technical assistance etc.
- (vii) As far as possible, manufacture of milk powder and other milk products should be taken up together in a plant.
- (viii) The Indian Standard Institution should define the quality standards of milk powders, condensed milks, cheese, casein etc".

The Government of India, Ministry of Agriculture, by their Resolution No. F.24-1/54-I.S, dated June 10, 1954, appointed an Expert Committee on the Prevention of Slaughter of Cattle in India the terms of reference of which, amongst others, included exploration of the possibility of making milk powder in suitable centres. The recommendations of the Committee are given in para 115 of their report, which reads as follows:—

"The Committee feel that there are suitable areas in the country which can be developed for providing sufficient milk for conversion into either milk powder or condensed milk on a small scale factory scale which can be transported to distant areas. The amount of milk available is, however, not sufficient to meet the entire demands of fluid milk for cities like Bombay and Calcutta and it will not be possible to replace the export of milch animals from breeding areas by the export of milk powder from these territories.

Although production of milk powder in certain areas will not, therefore, affect immediately the position of milch cattle import into cities like Bombay and Calcutta, the Committee feels strongly that production of milk powder and condensed milk should be undertaken as early as possible so as to make the country independent of foreign import as also to utilise fully the seasonal surplus in certain areas.

In the absence of detailed information necessary to decide on the suitability of areas for the establishment of a milk drying plant, the Committee are not in a position to indicate any particular place or places where such factories should be established. They recommend, therefore, that systematic surveys should be carried out of areas considered to be potentially suitable.

Due to the lack of sufficient knowledge regarding condensing and drying of milk of Indian cows and buffaloes, the Committee further recommend that immediate pilot investigations and research work should be undertaken both with cow and buffalo milk so that actual data in regard to the type and pretreatment of the raw material, capacity of the plant required, method of packing, keeping quality of the products and economies of production are available before factories are actually set up. Valuable experience is also likely to be gained from the working of the new dairy factory at Anand where there is a proposal to make some milk powder".

With financial assistance from UNICEF, the Government of India helped the Kaira District Cooperative Milk Producers' Union Ltd., Anand, in setting up a spray drying milk powder plant. While the project was sanctioned in 1953, the plant went into operation in 1956. This gave the country the first modern plant for the manufacture of spray-dried milk.

Another UNICEF, assisted milk conservation project, which included, amongst others, the manufacture of milk powder was sanctioned for Rajkot (Saurashtra) early in 1955. The project is in the process of implementation.

The Central Food Technological Research Institute, Mysore, also took up investigations concerning the manufacture of malted milk, and infant foods. With a view to helping the research workers in this field in designing their future work, the Government of India requested the F.A.O. in 1953 to provide the services of a suitable expert. The F.A.O. made available the services of Dr. R. Waite of the Hannah Dairy Research Institute, Airshire, Scotland, for a period of nearly six weeks late in December, 1955. Dr. Waite, after visiting different parts of the country made the following recommendations:—

- "1. A small experimental factory should be set up in a milk producing area to test the feasibility of infant food manufacture in India, and to determine the cost of production. The factory should be sited in a part of the country which

already produces both cow and buffalo milk surplus to the present requirements of the liquid market and which is unlikely to be used in the future for supplying processed liquid milk to a town.

Since the bacteriological quality of Indian milk is, at present, too poor to produce a good quality powder, this experiment should be closely coordinated with a drive for clean milk production in the area from which milk is to be collected. The experiment would make use of the Key Village scheme and all existing animal husbandry and veterinary advisory services. The experiment should be initiated either by the Council of Scientific and Industrial Research or the Ministry of Food and Agriculture and be conducted with the assistance of the necessary research institutes.

2. The Anand spray drying plant should, if the owners are agreeable, be used to prepare batches of infant food of varying composition. The composition of these experimental batches would be planned by the Central Food Technological Research Institute, Mysore, and the powder examined and stored for assessment of keeping quality by them.
3. An investigation should be made at the Central Food Technological Research Institute into the use of imported spray-dried skim milk powder and local milk, both buffalo and cow, for the production of baby foods by spray and roller-drying. The overall shortage of milk in India and the absence of clean milk in the villages that this method of manufacture offers most scope for the immediate future.
4. A research programme should be started at the Central Food Technological Research Institute which would include investigation of the:
 - (a) effect of the bacteriological quality of the liquid milk on the keeping quality and bacterial content of the powder when dried by the spray, roller, and vacuum processes;
 - (b) tension of the curd from raw, processed and dried buffalo milk;
 - (c) use of containers other than tin-plate cans for packing milk powder;
 - (d) tableting of fruit flavoured milk powder;
 - (e) preparation of lactic acid milk powders.

5. In order to meet any criticism of the nutritive value of the baby food prepared from buffalo milk, a large scale infant feeding experiment should be made in collaboration with the Medical Research Council or representatives of the medical profession. This experiment would, of course, be made only when a bacteriologically safe powder can be manufactured. The powder would, if the owners were agreeable, be prepared on the Anand spray-drier. An imported baby-food of similar composition should be included in the experimental design, which should be statistically sound.
6. The cocoa-flavoured malted milk powder already prepared at the Central Food Technological Research Institute should be developed further. This would be done mainly by the standardisation of all steps in the process, including malt-production. A comparison with barley as the malting cereal should be made.
7. The member of the staff who is engaged on this work should be sent abroad for further training after first spending a reasonable time (6-12 months) on the main problems outlined in paragraphs 6, 7 and 8 a.e. Any special difficulties would then probably have been experienced, and a visit overseas to other countries engaged on similar work would be more beneficial.
8. Some additional items of equipment are required at the Central Food Technological Research Institute for the manufacture and examination of infant and malted milk food".

The development of milk powder industry in India has received special attention under the dairy development programme included in the Second Five Year Plan, which provides for the establishment of seven milk powder factories—two each in Punjab, U.P. and Andhra and one in Bihar, at a cost of Rs. 1.40 crores. These factories are included in the public sector and the amount required for their establishment will be made available to the State Government, 60 per cent as grant and 40 per cent as loan, by the Central Government. The equipment required for one of these factories is to be obtained as aid from Technical Corporation Mission of U.S.A.

The Council of Scientific & Industrial Research sanctioned a grant to enable the Kaira District Cooperative Milk Producers' Union Ltd., Anand, to manufacture baby food according to the formula developed by the Central Food Technological Research Institute, Mysore. Feeding trials have been carried out with the baby food thus manufactured.

Recently, the Kaira District Cooperative Milk Producers' Union Ltd., Anand, have installed equipment for the manufacture of evaporated condensed milks to help the Milk Union to develop suitable techniques for the manufacture of these products from buffalo milk. The Indian Council of Agricultural Research have sanctioned a scheme for carrying out research work into the manufacture of these products.

It will thus be seen that a number of measures were taken in the past to develop an indigenous milk drying and condensing industry. But the country has remained without a well development industry and has continued to depend upon imports to meet the bulk of its requirements.



CHAPTER III

ESSENTIAL REQUIREMENTS OF MILK DRYING OR MILK CONDENSING INDUSTRY AND SCOPE FOR DEVELOPMENT IN INDIA.

All dairying countries, such as U.S.A., U.K., Scandinavia, New Zealand and Australia depend upon cow for their milk supply, whereas buffalo is the premier dairy animal in India. There is an important difference between the composition of buffalo milk and European cow milk in that the former contains almost double the quantity of butter-fat and nearly 10 per cent more solids-not-fat, its total solids content being 16–17 per cent, compared with 12-13 per cent. in case of the European cow. Even the Indian cow produces milk which is richer in butter fat by about 30 per cent than the average European cow, the total solids content of her milk being 13-14 per cent. Both the buffalo and Indian cow thus produce milk the fat: solids-not-fat ratio of which is very much higher than that of milk produced by the European cow. As such, the excess fat in their milk must be removed by partial skimming to make it more or less similar to milk used for manufacturing purposes in other parts of the world, if products of comparable composition are to be manufactured. Without that it may be necessary to develop new manufacturing techniques, which may also necessitate the designing and manufacture of new types of equipment suitable for manufacturing products which have a higher fat content.

Dried milk, whole or skim, and foods for infants and invalids normally do not contain more than 2-3 per cent water. In case of whole milk powder and skim milk powder the solids are entirely of milk origin; infant foods contain 90–100 per cent milk solids; while other patent milk foods may contain only about 40–50 per cent of milk solids. Sweetened condensed milk, conforming to the British Standards, contains 26 per cent water, 31.5 per cent milk solid and 42.5 per cent cane sugar, while evaporated milk contains 69 per cent water and 31 per cent milk solids.

The out-turn of different products from milk containing 12.5 per cent total solids is generally as follows:—

	Percentage
Dried whole milk	12
Dried skim milk	9
Foods for infants	12
Evaporated milk	40

On this basis, the milk equivalent of dried/condensed milks normally imported annually by India is estimated to be as follows:—

	Imports long-tons	Milk equivalent Tons	Percentage of total production
Dried whole milk	3,000	25,000	0·14
Patent milk foods for infants	3,500	29,000	0·17
Other milk foods	2,000	8,500	0·05
Evaporated/condensed whole milk	5,000	12,500	0·07
Evaporated/condensed skim milk	700	1,750	..
Dried skim milk	25,000	3,90,000	2·27
TOTAL . . . . .	..	4,65,750	2·70

The milk equivalent of the imported products, as estimated above, represents only about 2.70 per cent of the total Indian milk production for 1956, which was estimated at 17.2 million tons. Dried skim milk represented nearly 84 per cent. of the total milk equivalent of the imported products.

According to the report on the marketing of milk in the Indian Union, Indian total milk 1950, milk, as produced in India, is utilised as follows:—
production how used

	Percentage of total production
(1) Consumed as fluid milk	36·2
(2) Manufactured into	
(i) ghee	43·3
(ii) dahi	9·1
(iii) butter	3·3
(iv) Khoa	4·1
(v) Ice-cream	0·4
(vi) cream	3·6
	63·8
	100·0

It will be seen that of the total milk production, 63·8 per cent is used for manufacturing ghee, dahi, butter, khoa, etc. To divert 2·70 per cent of the total milk production or 4·23 per cent of the quantity of milk at present used for manufactures to prepare dried and condensed milk products, including patent milk foods of various kinds, should not seriously disturb the existing trade in indigenous milk products.

It should be noted, however, that whereas ghee, dahi, butter and other indigenous products are prepared on small scale cottage industry basis, milk powder, condensed milk, etc. are best manufactured on a factory scale. A 28" diameter, 60" long roller drying plant, which is about the smallest-sized commercial unit available in the market, requires a supply of 8 to 10 maunds of milk per hour. As a milk drying plant is generally run for 18–20 hours per day, about 150–200 mds. of milk is required daily for a plant of that size, which would yield about 18 to 24 mds. of dried whole milk. A spray-drying plant, on the other hand, needs a much larger quantity—units manufacturing less than 300 lbs. of milk powder per hour or about a ton per shift of 8 hours, which require nearly 2,500 gallons of milk per day, are seldom a business proposition. Commercial plants in U.K. generally handle 4–5 times that gallonage and manufacture 1000–1500 tons of milk powder per annum. The same is also true of a plant manufacturing condensed/evaporated milks. The milk must be clean, free from contamination as much as possible and fresh, because the quality of final products primarily depends upon the quality of the raw material used for their manufacture.

In India, by and large, milk production is small and scattered. This is both because of the small unit of production, which generally does not exceed one or two milch animals, and poor milk yield per animal. The average production per village and per square mile for the whole country does not exceed 2.38 and 1.08 mds. respectively. This means that to procure about 2,500 gallons of milk necessary to feed the smallest sized commercial spray-drying plant, an area of nearly 290 sq. miles including 132 villages would need to be tapped. Because of poor means of communications in case of most rural areas, this will by no means be an easy task, particularly during the rainy season.

Moreover, care necessary to produce clean milk is seldom exercised under average Indian conditions. Clean water, so necessary for producing milk free from contamination, is not available in many villages. Consequently, milk generally gets heavily contaminated due to which it has a low keeping quality. High temperature, experienced over large parts of the country, further accentuates the position by providing admirable conditions for the growth of bacteria which find their way into milk. Communications, particularly in rural areas, being generally underdeveloped, make quick transport very difficult.

On the other hand, in countries, where the dairy industry is well developed, a much smaller area supports a plant with a much higher throughput. Communications are better. Climate is temperate. Special efforts are made to produce clean milk and avoid contamination as far as possible. Naturally, milk can be collected more easily and quickly so that it reaches the factory in a fresh condition and the cost of collection is lower.

The high price of cow milk is another important factor, which militates against the development of a large milk drying/condensing industry in India. In U.K. and New Zealand, the price of cow milk used for manufacturing purposes is nearly 2 shillings per gallon or about four annas per seer. Except in some parts of Saurashtra there are few places in India, where the price of cow milk is as low as that. Naturally, the cost of producing these products indigenously, if cow milk is to be used for their manufacture, cannot be as low as that of the imported products.

But that is not all. Due to the cattle breeding policy in vogue almost all over the country according to which too much emphasis has been placed on draught quality to the neglect of milking quality, there are few areas left which would support a milk drying plant using cow milk.

There is, however, one redeeming feature, namely, that buffalo milk, which is much richer in butter-fat, is available at Rs. 15-16 per maund (or about three shillings per gallon) in some parts of India, particularly in the north, north-west and north-east (Punjab, U.P., Bihar, Rajasthan, Gujerat, Madhya Pradesh and Andhra). If allowance is made for the excess fat of buffalo milk, the prevailing price in such areas more or less equals the U.K. price. For instance, buffalo milk contains 7 per cent butter-fat on an average. Taking the average fat content of milk of European cow at 4 per cent, 100 lbs. of buffalo milk contain 3 lbs. of additional fat, which, when manufactured into and disposed of as ghee, is worth Rs. 6.28 at the prevailing price of ghee in rural areas. Partial skimming of 100 lbs. of buffalo milk to remove the excess fat would leave 94 lbs. of partially skimmed milk. The price of 100 lbs. of buffalo milk at the rate of Rs. 16 per md. works out to Rs. 19.51. Deducting Rs. 6.28, the price of excess fat, would leave Rs. 13.21 as the price of 94 lbs. of partially skimmed milk containing 4 per cent butter-fat and 13 per cent total solids, or Rs. 0.1405 per lb. or Rs. 1.405 per gallon, which is only slightly higher than the U.K. figure. By using buffalo milk, where it is available, at a price not exceeding Rs. 16 per md. it should, therefore, be possible to manufacture dried/condensed milks at a price, not very much higher than the cost of production of imported products.

As stated previously, dried and concentrated milks are in demand, mostly in the eastern and southern regions of the country, where supply of fluid milk is much too inadequate. This demand is particularly concentrated in the urban areas. The first objective must, therefore, be to meet the urgent demand for liquid milk, as to the extent that can be done, the demand for dried and concentrated milks would diminish. As a corollary to this, it is

equally important that requirements for manufacturing purposes should not clash with the requirements for liquid trade. In other words, where supply of milk is inadequate to meet the liquid requirements, or is likely to become so with the growth of population in future, manufacturing plants should not be set up, which means that only "milk pockets", which are not conveniently located for being tapped to meet the requirements of fluid milk, should be considered for this purpose.

Unfortunately, because of lack of organised production and marketing of milk in India, accurate information about the quantity of milk produced in different areas and the exact location of "milk pockets" is not available. The first attempt to estimate the quantity of milk produced in the country was made in the thirties by the Agricultural Marketing Adviser to the Government of India working in association with the Agricultural Marketing staff of each State. Use was made for this purpose of the figures of livestock population as obtained at the Livestock Census 1935 and the estimated average annual milk production per milch animal. The data thus obtained from each State were consolidated and published by the Agricultural Marketing Adviser as the "Report on the Marketing of Milk in India and Burma in 1940". This report was revised and republished in 1950, after the partition of the country. After the reorganisation of States, the Economic and Statistical Adviser, Ministry of Food and Agriculture published a fresh set of figures, which made use of the figures of 1956 Livestock Census in "Indian Livestock Statistics 1953-54 to 1955-56".

While these reports give an estimate of total annual milk production in each State, they do not show which particular area in a State has, or can have, the most plentiful supply. It is well known that the milk yield per animal may vary considerably from district to district and even taluqa to taluqa. The average figure for the whole State on the basis of which the production of milk has been estimated, is, therefore, of not much use in determining the milking production of any particular area and, therefore, in knowing the area of maximum supply, which information is necessary for selecting the most suitable locations for milk plants, although it gives a general idea of the States which can be considered for this purpose. To decide the exact location for a milk plant, therefore, it is necessary to make a correct assessment of the availability of milk in different parts by carrying out a detailed survey. Due to seasonal variations in production, such a survey must be carried out over a complete year. Happily, such surveys were initiated in a few parts of the country, which were being considered for the location of some of the milk drying plants included in the public sector of the Second Five Year Plan.

The following are the latest estimates of (i) total milk production and (ii) quantity available *per capita* based on the 1956 Livestock Census and 1951 Human Census respectively:—

Availability of milk in different State	Estimated total milk production (thousands maunds)	Ounces per day
Andhra Pradesh	40,897	4.72
Assam	3,341	1.25
Bihar	45,625	4.29
Bombay	49,645	3.71
Jammu & Kashmir	3,487	2.85
Kerala	4,940	1.32
Madhya Pradesh	31,766	4.39
Madras	30,315	2.44
Mysore	17,949	3.34
Orissa	10,002	2.46
Punjab	61,046	13.65
Rajasthan	40,011	9.05
Uttar Pradesh	122,215	6.97
West Bengal	19,503	2.64
Himachal Pradesh	2,399	7.80
Others*	4,595	5.26
Total (India)	477,736	4.76

It will be seen that the quantity available is the highest in Punjab, being nearly three times the All India average. Next in order come Rajasthan, Himachal Pradesh and Uttar Pradesh. The supply is particularly low in Assam, Kerala, Madras, Orissa, West Bengal and Mysore.

It will, however, not be correct to go entirely by these average figures appertaining to a whole State, as there are large inter-regional variations. A few examples will make the position clear. The *per capita* supply is 3.71 oz. in Bombay State, but it is well known that the supply is much higher in certain parts of that State such as Kaira, Baroda and Ahmedabad district of Gujerat, and the Saurashtra region, etc. Similarly, while the overall figure in Bihar is 4.29 ounces, the quantity available is several times that in North Bihar, and much lower in the Chhota Nagpur region. The same is also true of Uttar Pradesh, where the production is much higher in the western than the eastern districts. In fact, there is, perhaps, not much differences between the supplies available in the Hariana tract of Punjab and Meerut, Bulandshahr, Aligarh and Mathura districts of U.P. The Krishna and Guntur districts of Andhra Pradesh

*Comprising Andaman and Nicobar, Laccadives, Minicoy and Amindivi Islands, Delhi, Manipur, Sikim and Tripura States.

and Gwalior and Indore districts of Madhya Pradesh are other rich "milk pockets" in States the general milk production of which is rather low.

While we would leave it for detailed milk surveys, which, we recommend, should be undertaken as early as possible to discover the best milk pockets in each State, we are of the view that such surveys may, in the first instance, be carried out in the following districts which, on the basis of available information, appear to be more promising:—

Punjab	. . . . .	Amritsar, Patiala, Sangrur, Kapurthala, Ferozepur, Rohtak, Gurgaon, Karnal and Hissar.
Uttar Pradesh	. . . . .	Meerut, Bulandshahr, Muzaffarnagar, Aligarh, Mathura, Agra and Etah.
Rajasthan	. . . . .	Alwar and Bharatpur.
Bihar	. . . . .	Darbhanga, Somastipur, North Monghyr and Saharsa.
Bombay	. . . . .	Kaira, Baroda, Ahmedabad, Girnar, Mehsana, Porbunder, Satara, Amraoti, Jalgaon.
Madhya Pradesh	. . . . .	Gwalior and Indore.
Andhra Pradesh	. . . . .	Krishna, Guntur, and Nellore.
Madras	. . . . .	Coimbatore, and Nilgiris.

Preliminary information available shows that some of them may be able to feed more than one moderate-sized milk drying plant. Moreover, supply is bound to increase, once a good outlet is provided for milk, as under the prevailing conditions lack of a remunerative market is hampering the spread of improved techniques of animal husbandry, and therefore, a rise in production.

CHAPTER IV

PRESENT POSITION OF THE DRIED, CONCENTRATED AND MALTED MILK INDUSTRY IN INDIA.

There are only two plants, which are manufacturing dried milks at present. One of these, a spray-drier, which was provided by UNICEF, is located at Anand, and the other a roller-drier is at Varanasi. The drying capacity of these two plants is 10,000 lbs. and 1800 lbs. respectively per shift of 20 hours. Assuming that each plant is worked 20 hours daily for 300 days in a year, they can together manufacture nearly 1600 tons of dried milk annually. Their actual production has, however, been much smaller. This is because of difficulties in obtaining the required quantity of milk throughout the year.

Recently, the Kaira District Cooperative Milk Producers' Union Ltd., Anand, has also installed a plant for the manufacture of condensed/evaporated milks. The installed capacity of this plant is 30,000 lbs. and 50,000 lbs. of condensed/evaporated milk per day of 20 hours run respectively. Preliminary trials necessary to perfect the manufacturing technique are in progress under a scheme which is being financed by the Indian Council of Agricultural Research and it is hoped the plant will go into commercial production during the coming winter season. As the total quantity of milk available for manufacturing purposes after meeting the demand for market milk of the Bombay Milk Scheme is less than the total installed capacity of the milk drying and milk condensing plants, and as at the prevailing prices of skim milk powder and condensed/evaporated milks the latter will yield a better return for the primary product, the Union hopes to manufacture only about 800 tons of skim milk powder annually, instead of the installed capacity of 1800 tons and approximately 1,000 tons of condensed milks.

A small milk condensing plant, which can manufacture 200 lbs. of condensed milk per hour is also in use by M/S C. & E. Morton (India) Ltd. at Marhowrah in Bihar. Its entire production, which does not meet the present demand, is used in the preparation of toffees and other specialities containing condensed milk and the management of that plant are proposing to instal another condensing unit with capacity to manufacture 500 lbs. per hour, the entire production of which, too, will be absorbed by themselves.

There are two other roller-drying plants, which are lying unused, one in Calcutta and the other at the National Dairy Research Institute, Karnal. (The former is the plant which was worked during the last war at Dum Dum, but, as stated previously, had to close down. The latter was in use at the Experimental Creamery of the Central Government at Anand until 1949, when that creamery was closed down as a measure of economy. Such machinery is not manufactured in India at present. In view of the difficult foreign exchange position, use must be found for it before fresh imports are licensed.

Four new milk drying plants are coming up in the Public Sector. One of these, for which assistance is being provided by UNICEF, is being established by the Government of Bombay at Rajkot. It will be equipped to manufacture 300 lbs. of milk powder per hour or nearly 3 tons per working day of 20 hours, which should give an ultimate annual output of nearly 900 tons, assuming that it will be possible to operate the plant at full capacity for 300 days. The land required for this plant has been acquired; the building is being planned; and a part of the required equipment has been received. The plant, it is hoped, will come into commission in 1959.

The second plant, which is being set up by the Punjab Government, will be located at Verka near Amritsar. Assuming that it will be able to run at the full installed capacity for 300 days in a year, it should ultimately produce nearly 1,800 tons of milk powder annually. The equipment required for this plant is being provided by the Technical Cooperation Mission of the American Government. Tenders for its supply have been invited; land required for locating the factory and its ancillary three milk collection centres is being acquired; plans for the buildings are being prepared; and it is hoped the plant will go into production during 1959.

The third plant is to be set up by the Andhra Government in Krishna District, which is an important ghee producing area. Milk survey necessary to decide its exact location and capacity has been initiated recently. As no foreign aid is available for it, it will be possible to implement this project only if the foreign exchange necessary for the required imported equipment can be made available. While the exact quantum of foreign exchange would be known after the capacity of the proposed plant has been decided, assuming that the capacity will be equal to that of the Amritsar plant nearly Rs. 14 lakhs would be required. The fourth plant is in view at Barauni in Bihar. The proposal is to expand the creamery, which is being established there with equipment being provided by T.C.M., into a milk powder factory with capacity equalling the Amritsar plant. Imported equipment estimated to cost Rs. 11 lakhs would be required for it.

The prevailing balance of payments difficulty, due to which imports of milk products have had to be drastically restricted, New plants Private Sector has encouraged a number of foreign manufacturers to consider establishing plants for the manufacture of their products within India. So far, applications for permission to set up plants have been received from four firms, of which three, namely, (i) M/s. Horlicks Ltd. (ii) M/s. Glaxo Laboratories (Private) Ltd., and (iii) M/s. Nestles (Private) Ltd., have been given licences and facilities. The range of products sought to be manufactured by the three plants, when working at full installed capacity, is shown below:—

Programmed production per year—tons

	Glaxo Lab. (P) Ltd.	Horlicks Ltd.	Ashok—Nestles	Total
Condensed milk	4000	4000
Powder milk	228		678
Butter and ghee	204		279
Baby food	2520	228		3418
Malted milk	900		900

It is needless to say that the actual production will be lower in the earlier years, as it may take some time to organise and develop milk supplies necessary to attain full production.

On the basis of plants, which are in operation or are expected to go into production within the next two years, the total annual indigenous production of various milk products may be estimated as under:—

	Kaira	Rajkot	Amritsar	Andhra	Health-ways	Nestles	Glaxo	Horlicks	Total
Dried whole milk . . . . .	...	...	...	...	...	450	...	228	678
Milk foods for infants . . . . .	...	...	...	...	250	670	2520	228	3668
Other milk foods . . . . .	...	...	...	...	...	...	...	900	900
Evaporated/condensed full cream milk	1000	...	...	...	...	4000	...	...	5000
Evaporated/condensed skim milk . . . . .	...	...	...	...	...	...	...	...	...
Dried skim milk	800	900	1800	1800	...	...	...	...	5300

A comparison of these figures with the normal annual imports, as reported at page 8, would show that the indigenous production would more

or less equate the past normal imports in case of evaporated/condensed full cream milk and baby food, but would be only 22.6 per cent. of imports in case of dried whole milk, 45 per cent. in case of other milk foods and about 22 per cent in case of dried skim milk. A plant used for the manufacture of dried skim milk can, however, also be used to produce whole milk powder and milk foods for infants. The primary raw material—whole milk, too, is the same in each case. It should, therefore, be possible to meet the full requirement of dried whole milk also from indigenous sources; but that, if done, would reduce the production of dried skim milk by nearly 2,400 tons, bringing it down to only 2,900 tons or about 12 per cent of the optimum imports. There would appear to be a good case for doing this. Firstly, the conversion of milk into dried whole milk and infant foods would yield a higher financial return than its disposal as dried skim milk and butter fat. Secondly, the use of milk for the manufacture of dried whole milk and infant foods, which products are required for consumption by priority consumers, is to be preferred to its utilisation for the production of dried skim milk and butter fat, which are consumed by adults. The existing plant at Anand and the new plants coming up in the public and private sectors should, therefore, be used for the manufacture of whole milk powder and milk foods for infants, to keep the country self-sufficient in these commodities in the years to come, when, with the increase in population and improvement in purchasing power the demand for milk and milk products is sure to grow. It is only after that goal has been achieved that they should take up the manufacture of skim milk powder.

The Second Five Year Plan provides for four additional spray drying plants—milk plants to come up in the public sector in Andhra Pradesh (1), Uttar Pradesh (2) and Punjab (1). Provided foreign exchange necessary for the imported equipment, estimated to approximate Rs. 60 lakhs, can be released, these plants, too, can be established. Assuming that the installed capacity of each would equal that of the Anand plant, their total annual production would come to 7,200 tons of dried skim milk.

The Second Plan also includes 12 rural creameries to be established in the following States:—

Assam	.	.	.	.	.	.	.	.	.	1
Bihar	.	"	.	.	.	.	.	.	.	2
Bombay	.	.	.	.	.	.	.	.	.	2
Madhya Pradesh		.	.	.	.	.	.	.	.	1
Orissa	.	.	.	.	.	.	.	.	.	1
Punjab	.	.	.	.	.	.	.	.	.	2
Rajasthan		.	.	.	.	.	.	.	.	1
Utar Pradesh		.	.	.	.	.	.	.	.	2
										12

Due to lack of adequate milk supply, the Assam and Orissa creameries cannot be established, while one of the two creameries in view for Punjab has been merged with the composite milk supply-cum-milk powder factory at Amritsar, leaving 9 creameries to be established. Each of these is to be equipped to manufacture butter/ghee from 200–500 maunds of milk or cream obtained from that quantity of milk, and if provided with a roller drying plant, can additionally manufacture nearly 240 tons of dried skim milk annually, giving a total production of 2,160 tons. This would involve a foreign exchange expenditure of nearly Rs. 15 lakhs on imported milk drying equipment.

By incurring foreign exchange expenditure of Rs. 1 crore, therefore, it would be possible to provide additional installed capacity of 9,360 tons to manufacture dried skim milk, which when added to 2,900 tons, the installed capacity of the existing plants and of the plants which are being installed, should enable the total annual production to increase to 12,260 tons, which is about 51 per cent of the country's estimated annual commercial imports in the past.

It is important to realise that at the prevailing price of milk in India, we cannot produce dried skim milk as cheap as some Low financial return from dried skim milk other countries. For instance, pure buffalo milk, containing 7 per cent butter fat on an average, is generally not available at a price lower than Rs. 16 per maund. No doubt, the price becomes lower than that during the winter season; but it goes higher during summer; and it is safe to take the average all-the-year round price at Rs. 16 per maund ex-factory, which works out to Rs. 19·51 per 100 lbs. Now 100 lbs. of milk, containing 7 per cent butter fat, when separated to produce cream containing 50 per cent butter fat, would yield 14 lbs. of cream and 86 lbs. of skim milk. Taking the recovery of butter fat at 93 per cent, when cream is manufactured into ghee, 14 lbs. of cream would yield 6·51 lbs. of ghee, which at Rs. 2·25 per lb. (this allows for the cost of manufacture) would fetch Rs. 14·65. Deducting that from Rs. 19·51 would leave Rs. 4·86 as the cost of 86 lbs. of skim milk, which on drying would yield about 8·5 lbs. of dried skim milk. This gives Rs. 0·57 as the cost of raw material per lb. of dried skim milk. Taking the cost of manufacture and bulk packing at Rs. 0·25 per lb. and profit at 10 per cent, the ex-factory price comes to Rs. 0·90 or Rs. 2,016 (£150) per ton, which is nearly 250 per cent of the cost in countries like New Zealand and Australia, which have a large milk drying industry, and nearly 180 per cent of the prevailing c.i.f. Indian port price of the imported product. Of course, the price is particularly low in New Zealand and Australia, so that to compare the Indian cost of production with the price in those countries is not altogether fair. But the Indian cost does not compare favourably with that in U.S.A. and Canada either. For instance, the minimum guaranteed price fixed by the Government in 1916

cents per lb. in U.S.A. and 15 cents per lb. in Canada, which works out to nearly Rs. 0.768 and Rs. 0.720 respectively. It is because of this relatively much higher cost of production in case of the indigenous product, which depends upon the price realised for butter fat, that the Kaira District Milk Producers' Union Ltd., sell dried skim milk at Rs. 1.12 per lb. or Rs. 2,506 (£188) per ton.

It should be obvious that disposal of milk as ghee or butter and dried skim milk cannot be a very attractive proposition under our prevailing prices of raw milk. It was the realisation of this fact which induced the Kaira District Co- Producers' Union Ltd., Anand, partially to switch over from the production of dried skim milk and butter to the manufacture of condensed/evaporated milks. Large scale development in this line under the private sector need not, therefore, be hoped. In other words, milk powder factories to manufacture dried skim milk would have to come up mostly in the public sector as a means of finding a remunerative method of marketing milk, which is available in certain milk pockets, as possible.

It is thought that on the basis of supplies of milk now available, there is scope for establishing at least another 10-12 New Plants—
Third Plan spray drying plants, as detailed below, during the Third Five Year Plan:—

Andhra	.	.	.	.	.	.	.	.	.	1—2
Bihar	.	.	.	.	.	.	.	.	.	1
Bombay	.	.	.	.	.	.	.	.	.	1
Madhya Pradesh	.	.	.	.	.	.	.	.	.	1—2
Madras	.	.	.	.	.	.	.	.	.	1
Punjab	.	.	.	.	.	.	.	.	.	2
Rajasthan	.	.	.	.	.	.	.	.	.	1
Uttar Pradesh	.	.	.	.	.	.	.	.	.	2
										10—12

Assuming that each of these plants would be capable of manufacturing 300 lbs. of dried skim milk per hour, their total annual production would aggregate to 10,800 tons, which will increase the total installed capacity to almost the estimated annual commercial imports in the past.

CHAPTER V

PLANT AND MACHINERY REQUIRED FOR CONDENSED AND DRIED MILKS AND THE SCOPE FOR INDIGENOUS MANUFACTURE OF SUCH MACHINERY.

Sweetened condensed milk and evaporated milk are manufactured by concentrating milk of standard composition under partial vacuum. Concentration is carried out under partial vacuum and not at atmospheric pressure because of economy and rapidity of operation and to protect milk against heat damage. The ratio of concentration is generally 1:2½. The manufacturing techniques are somewhat similar in case of both the products. The differences arise from the fact that, whereas a high concentration of sugar (40 to 45 per cent of the composition of the finished product) is used to give the sweetened condensed milk its long keeping qualities, the same object is achieved by heating evaporated milk to sterilise it and by homogenising it to prevent the separation of fat during storage. Both kinds of products are packed in hermetically sealed containers.

The equipment for a condensary manufacturing sweetened condensed milk consists of:—
Equipment required for sweetened condensed milk

1. Milk cans and/or milk tankers (road and/or rail road) for the transport of milk from dairy farms to the condensary.
2. Milk reception equipment consisting of appliances for the weighing and conveyancing of milk in the condensary.
3. Milk clarifiers, milk separators, milk coolers and milk storage tanks—insulated and/or refrigerated and uninsulated and milk pumps.
4. Heat exchangers for preheating and holding milk at the desired temperature.
5. Sugar mixing tank.
6. Vacuum pan, single or multiple effect with or without thermocompression or mechanical vapour compression.
7. High pressure pumps.
8. Forced crystallisation tanks.
9. Equipment for the forming of containers and hermetically sealing them.
10. Filling equipment.

11. Laboratory equipment for the testing of chemical and bacteriological quality of milk, condensed milk etc.
12. Steam generators.
13. Refrigeration equipment.

In a modern condensery, all equipment coming in contact with milk is made from 18–8 stainless steel. The use of copper and copper alloys, so common for this purpose until recent years, has been abandoned.

Equipment for the manufacture of evaporated milk is also more or less the same, except that while no sugar mixing tank for evaporated milk is needed, homogeniser and steriliser are required.

Milk powder is also a type of concentrated milk. For its manufacture, milk, concentrated or not, is dried to a point that it loses most of its moisture. The drying may be accomplished by cold or by heat. The common commercial methods make use of heat and follow two alternative processes, namely, (i) roller drying, and (ii) spray drying.

In the roller drying process "milk is applied in a thin film upon the smooth surface of a continuously rotating steam heated metal drum, and the film of dried milk is continuously scraped off by a stationery knife located opposite the point of application of the milk". The dryer may consist of a single drum, a twin-drum or a combination of single drying drum and a film-applying drum. The drying may be accomplished under atmospheric pressure or, by locating the drum in a vacuum chamber, under partial vacuum. Milk may be condensed prior to its drying or not. Precondensing is practically indispensable in case of single-drum dryers.

The atmospheric pressure roller drying process has several advantages the spray process, chief of which are its greater elasticity, relatively lower initial capital cost, both on plant and building, simplicity, economy of operation and superior keeping quality of the dried milk. A beginning may be made with only one set of twin rollers and additional sets installed as more milk (and capital) become available. The smallest commercial set available can dry only about 8–10 maunds of milk per hour. Assuming that it is worked for 20 hours daily, it will require only about 150–200 maunds of milk per day to keep the plant in full production. As will be shown later, the minimum requirements of a spray drying plant are considerably higher.

The main drawback of the roller drying process, unless it is carried out under vacuum, is the lower solubility of the resulting powder, which ranges from 70–85 per cent in cold water and 80–95 per cent in hot water, depending upon how carefully it is manufactured. This makes the pro-

duct unsuitable for purposes of reconstitution such as for use as table milk. In other countries, roller dried milk is, therefore, used, by and large, for manufacturing proposes—in ice-cream, bread, biscuits etc. or for feeding to livestock. This drawback can be obviated by roller drying in a vacuum chamber. But because of the higher cost involved and the complicated nature of the process, it loses much of its advantage.

In spite of the lower solubility of the resulting product, the roller drying process is preferred for the manufacture of baby foods by some well known concerns. This is because of the superior keeping quality of the resulting product. It is also claimed that the product gives a softer curd, which is more easily digestible.

The equipment required for the manufacture of milk powder by the roller drying process would naturally depend upon whether milk is precondensed or not, whether it contains fat or not and whether drying is carried out at atmospheric pressure or in vacuo. The equipment for the collection and transport of milk from dairy farms to the drying plant and for its subsequent weighment, conveyancing, storage, standardisation or separation, quality control and generation of steam etc. is the same as was described in case of a condensery. Where precondensed milk is to be used for drying, a vacuum pan is also included. A homogeniser is necessary where, milk to be dried, contains fat. Equipment for the manufacture and packaging of butter, including cold storage and refrigeration machinery are also required, if skim milk powder is to be manufactured from whole milk. The special equipment characteristic of a roller drying plant really consists of the roller drier operating under atmospheric pressure or in vacuo. Equipment is also required for the conveyancing and elevation of the dried milk, which is scraped off from the roller in the form of flakes, and for grinding, sifting and packaging it.

The spray drying process employs the method of spraying a fog-like mist of milk in the presence of a current of heated air in a large chamber made up of stainless steel. The milk dries instantaneously transferring its moisture to the hot air and falls down in the form of powder in the chamber, wherefrom it is conveyanced and packaged. The used up air is disposed of separately. Precondensing is an essential part of the spray drying process, as drying of uncondensed milk requires too much time and steam and is, therefore, uneconomical. It also yields powder of very small particle size, which leads to heavy entrainment losses, is difficult to handle, is less easily miscible and, if containing fat, is prone to early flavour deterioration.

The primary advantage of spray drying is that it yields a product which is practically completely soluble in cold water. Advantages of spray drying Milk powder required for reconstitution is, therefore, dried by this process. Another advantage is that it is more economical of steam compared with the roller drying process, if precondensed milk is not used in case of the latter.

The chief points against the spray drying method are its inelasticity, larger milk requirements and higher capital cost of equipment and buildings. Disadvantages of spray drying A unit cannot be considered, if the quantity of milk available is less than 30,000 lbs. daily, although most commercial plants handle several times that quantity to secure most economical production. Another point is that the complex nature of the plant requires more competent personnel to handle it.

The special equipment characteristic of a common spray drying plant Equipment required for spray drying plant is the spray drying chamber and its ancillary plant for the precondensing of milk in vacuo. The other equipment does not differ materially from a roller drying plant of equivalent capacity.

In view of what has been stated previously, the choice of a particular method of drying of milk under Indian conditions Relative suitability of the two processes under Indian conditions must be determined primarily by (i) the quantity of milk to be handled, (ii) capital available and (iii) the usage of milk powder in view. Where the capital and quantity of milk available are relatively small, roller drying must be the obvious choice. This is not to say that roller drying is not suitable for handling large daily throughputs, for, as stated earlier, elasticity is a special feature of this method and by increasing the number of roller drying sets coupled with precondensing one can have as large a plant as desired. What is implied is that a roller drying plant can be a practical proposition, where due to lack of adequate supply of milk or finances, spray drying is out of question. Roller drying can also be adopted for the manufacture of baby foods and for drying skim milk, butter milk, whey etc. to be used for manufacturing purposes or for feeding to livestock, but not for the drying of milk, whole or skim, which is to be used for reconstitution for liquid consumption. For the latter, spray drying must be the obvious method.

Both the methods have, there, a place under Indian conditions—roller drying, where quantity of milk available does not exceed 300 mds. per day, and that or spray drying for larger daily throughputs.

M/s A.P.V. Engineering Co. (Private) Ltd., Calcutta, in association with M/s. A.P.V. Co. Ltd., London have been fabricating stainless steel hollow-ware, such as milk tanks, bath pasteurisers and other process vessels for the past nearly 10-15 years. They also manufacture mild steel vessels for various applications. But their present facilities for manufacturing equipment other than those listed are not large. Recently, M/s Larsen & Toubro Ltd., have been licensed to manufacture more or less similar equipment. There are also some other smaller establishments of chemical engineers, who can fabricate process vessels from stainless steel. M/s Can Manufacturing Co., Worli, Bombay and M/s Hydro (Engineers) Private Ltd., Mazegoan, Bombay, manufacture tinned steel cans, while M/s Jeewanlal (1929) Brothers, Calcutta, manufacture aluminium alloy milk cans of some kinds. M/s Texmaco Ltd., Calcutta, and M/s Hooghly Docking and Engineering Co. Ltd., Howrah, have taken up the manufacture of steam boilers recently. But there is, at present, no organisation for the indigenous manufacture of can washers-rotary or straight-through, plate head exchangers, cream separators, calorifiers, homogenisers, stainless steel butter churns, butter, condensed milk and milk powder packaging equipment, compressors and roller dryers. In case of spray drying equipment, while there is not likely to be much difficulty in fabricating the spray drying chamber, some essential items like atomiser etc. required for it will need to be imported.

In view of the great scope for the development of an organised dairy industry in India, it is important that indigenous manufacture of dairy equipment of all kinds is organised as speedily as possible. This may be done by making use of the private manufacturing industry as far as feasible, but what it may not be possible to manufacture in that manner should be taken up in a new factory which may come up in the Public Sector. The latter, it is thought would be necessary, unless a number of private concerns are forthcoming. This is because hardly any one dairy company manufactures all the varied kinds of equipment required for a milk plant. Most of them specialises in the manufacture of only a few lines.

But whether manufacture is arranged through the Private Sector or in a public plant, it will be necessary to secure foreign collaboration to obtain technical know-how regarding designs, techniques of manufacture etc. At least four Indian dairy companies are associated with some well-known dairy engineering companies abroad, the names of these and their major associates being.

Name of Indian Company	Name of major associate
(i) A.P.V. Engineering Co. (Private) Ltd., Calcutta.	A.P.V. Company London.
(ii) Larsen & Toubro Ltd., Bombay	Silkeborg Maskinfabrik A/S Silkeborg Denmark.
(iii) Vulcan Trading Co., (Private) Ltd., Bombay.	A.V. Separator, Sweden.
(iv) T.T. (Private) Ltd., Bangalore	De Danske Mejerier Maskinfabrik, Koldin Denmark.

The possibility of these firms taking up the manufacture of dairy equipment of all kinds in collaboration with their overseas associates, within an agreed period, should be first investigated. But if this approach does not prove fruitful, other engineering concerns, who are manufacturing allied equipment, should be encouraged to undertake manufacture under licence from some well-known overseas manufacturers, who are not already represented in this country. The establishment of a plant in the Public Sector should be undertaken if even this method does not succeed.

It need hardly be said that the industry can be interested in the proposition only if it can see definite promise of a good business, for it is the lack of demand in the past which is responsible for the present lack of an indigenous manufacturing industry. The Government should, therefore, come forward with a precise plan for the establishment of milk processing and manufacturing plants over the coming 5-10 years to guide the prospective manufacturers in deciding the lines of manufactures they should undertake and the size of plant they should consider putting up for that purpose.

CHAPTER VI

SUMMARY & RECOMMENDATIONS

Milk is in demand by almost every one all over India. But the **supply**, which varies greatly from one part to another, is generally unsatisfactory from the standpoint of **quantity**, **quality** and **price**, particularly in large consuming centres. This has given rise to the use of condensed and evaporated milks, milk powder, both whole and skim, and proprietary milk foods for infants and invalids. The demand for these products varies in different parts of the country and is, in fact, an index of the supply of fresh milk locally available. There is, undoubtedly, a strong preference for fresh milk. But where that is not available in sufficient quantity, or its quality is considered doubtful, as is the case in most towns, particularly those lying in the eastern and southern States, manufactured products have, per force, to be consumed. The position in this respect will remain unchanged until the existing milk supply arrangements can be improved.

According to the 1950 Census, there were 74 cities, the population of each of which exceeded a lakh and another 91, the population of which was between 50,000 and a lakh. Demand bound to continue With industrialisation and consequent urbanisation, and the growth of population, the number in each category has considerably increased. New townships have also come up, such as at Rourekala, Bhilai and Durgapur and it would be safe to assume that the number of cities with population exceeding 50,000 would be in the neighbourhood of 250. The milk supply of few of these cities is satisfactory at present. Under the Second Five Year Plan, no doubt, 52 cities are to be equipped with modern milk treatment plants, each, with some expansion in future, capable of ultimately supplying the entire requirements of the city concerned. But it will take these plants some years to be able to meet the full requirements of the entire population and, meanwhile, many people will have to keep on depending upon the manufactured milk products, as they are doing at present. There is also a more or less permanent demand from the defence forces stationed in forward positions. The demand for such products is, therefore, bound to continue for some considerable time in spite of the urban milk supply schemes included in the Second Five Year Plan or which may be taken up during the future Plan periods.

As explained in Chapter I, the country has had to depend upon imported products to meet this demand, the value of such products being of the order of Rs. 6 crores annually. It is only in recent years that a spray-drying milk powder factory was set up within the country, to which has lately been added a section for the manufacture of condensed and evaporated milks. The total production of this factory, however, has been relatively very small to-date.

Due to the current balance of payments difficulties, the imports of milk products have had to be curtailed rather heavily so much so that even the quota for baby foods has had to be reduced to about a quarter of the normal imports. *The need for the establishment of a well-organised milk condensing and drying industry is, therefore, great and urgent in the interest of consumers.*

It is equally necessary to set up milk condensaries and drying plants to provide a remunerative market to primary producers belonging to "milk pockets", which are remote from large consuming centres. In the absence of such plants, milk produced in these areas is disposed of as ghee, which does not give an attractive return to the producers. The Committee are satisfied that by using high fat-buffalo milk, which is abundantly produced in many of these milk pockets, condensed and evaporated milk and full-cream milk powder can be produced at prices, which will compare favourably with the imported products and this, if done, will ensure a much higher return to the primary producer than he gets at present. The latter will also be the case where buffalo milk is disposed of as butter or ghee and skim milk powder, although without a material reduction in the cost of production of milk, it will, it is thought, not be possible to produce skim milk powder at as low a price as in some other countries, which have a well-developed dairy industry.

This, however, is hardly of much consequence in the context of the current balance of payments difficulties, due to which, as stated earlier, imports have had to be curtailed thus giving virtually protected market to the indigenous product.

The Committee, therefore, recommend that a well-organised indigenous milk condensing and drying industry should be established as speedily as possible not only to meet the requirements of condensed, evaporated and dried milk, which the country is unable to import at present, but also to provide a remunerative outlet for surplus milk available in certain areas, which is not being marketed very profitably at present. This, they feel, will give a great fillip to the production of more milk in rural areas, as has happened around Anand.

The Committee note with satisfaction the developments in this regard, Plants coming up which are taking place both in the public and private sectors. These developments comprise establishment of two spray-drying milk powder factories at Rajkot and Amritsar in the public sector and three plants one for the manufacture of malted milk at Nabha, second for the production of condensed milk at Moga and the third, a roller drying set up, for the manufacture of a well-known brand of baby food at Aligarh—in the private sector. The Rajkot plant, although located in one of the most prolific cow milk pockets in the country, the Committee understand, has been designed to manufacture butter, ghee, and skim milk powder. They think that the proper use of this plant will be to manufacture baby food instead of skim milk powder and for this purpose the formula developed by the Central Food Technological Research Institute, Mysore, may be tried. Likewise, the Amritsar plant, too, should be used for the manufacture of baby food to the extent cow milk is available for this purpose and preference should be given to the manufacture of full-cream milk powder from buffalo milk rather than using it for producing butter, ghee and skim milk powder. This, if done, the Committee hope, will make the country more or less self-sufficient with respect to condensed, evaporated and dried milks, including baby foods, but excluding skim milk powder, on the basis of her imports of these products in the past. Additional plants will be required to meet the requirements of skim milk powder.

Due to the lack of care exercised in the production of milk under average Indian conditions, it gets heavily contaminated with bacteria, which not only reduces its keeping quality and may cause difficulties in condensing and drying, but also leads to the production of a milk powder which contains large number of dead bacteria. In order to avoid such contamination milk should be produced hygienically and extension work should be undertaken by competent technical staff in the milk shed of each plant.

Extension service is also necessary to increase and intensify milk production in the selected areas, so that the quantity required by each plant can be produced from as small an area as possible. The latter will lead to economy in the cost of collection as well as ensure supply of fresh milk to the plant. The extension work should consist of organisation of producers' cooperatives to market milk and to arrange supply of feed, fodder, fertilisers and improved seeds, grant of loans to enable producers to purchase better milking stock, supply of well-bred bulls and/or institution of an efficient artificial insemination service, provision of a good veterinary service and purposeful propaganda to improve the existing feeding and management practices, including care in the production and handling of milk. Special

staff necessary for this purpose should be employed by the State Governments concerned.

It will also be necessary to provide a net work of all-weather roads in the milk sheds of the plants, where such roads do not exist at present, to speed up transport of milk, as has been done to facilitate transport of sugarcane from cultivators fields to sugar factories. Because of the perishable nature of milk, the need is even greater in case of milk plants. The States concerned should, therefore, give a high priority to this requirement in their overall road building programmes.

The Second Five Year Plan also provides for the establishment of six other spray-drying milk power factories in the public sector two each in Andhra Pradesh and U.P. and one each in Bihar and Punjab. The Plan also includes nine rural creameries each of which can be equipped with a roller-dryer. It has not so far been possible to execute these projects basically due to non-release of foreign exchange required for the imported equipment. The completion of these projects will give the country installed capacity equalling 47.7 per cent of her past commercial imports of skim milk powder and will necessitate foreign exchange expenditure of the order of Rs. 1 crore on the assumption that equipment required for these plants cannot be manufactured indigenously, partially or fully, within the current Plan period. The Committee recommend that, as suggested in a subsequent paragraph, the question of indigenous manufacture of the required equipment should be examined speedily by the Ministry of Commerce and Industry in collaboration with the Ministry of Food and Agriculture, and foreign exchange necessary for what cannot be thus obtained should be released so that the projected plants can come up expeditiously.

The Committee think that there are many other areas lying in Andhra Pradesh, Bihar, Bombay, Madras, Mysore, Madhya Pradesh, U. P. and Punjab, which can feed a milk condensery and/or milk powder factory. While they have a fairly good idea of the approximate locations of nearly a dozen plants for this purpose, they feel that these should be confirmed by carrying out detailed milk surveys. They recommend, therefore, that a precise plan should be prepared as early as possible for the establishment of these plants in different parts of the country during the next 5-7 years. The plan should indicate which particular area will be best suited for the location of a milk condensery, a roller-drying plant or a spray-drying plant.

To prepare a realistic plan, it will be necessary to carry out milk surveys in the better known "milk pockets" all over the country. The Committee recommend that such surveys

should be undertaken as early as possible. The results of these surveys will be helpful not only to the State Governments in planning the plants which may come up in the public sector, but also to private parties who may be considering putting up such plants. There is a general impression in other countries that India does not offer much scope for a milk drying industry. This erroneous idea can only be dispelled by factual data regarding availability of milk which the milk surveys would provide. In deciding the locations of plants of different kinds and capacities, the requirements of fresh milk, both present and future, of urban consuming centres lying in the vicinity of the proposed locations should be carefully assessed. Plants should be considered for only such places as can supply milk in excess of the quantity required for liquid consumption. Subject to this overriding condition, it will be an advantage to include equipment for the manufacture of products in an urban milk treatment plant.

As few States possess experienced staff for carrying out milk surveys, and to ensure uniformity of technique, it will be desirable to entrust this work to a Central staff employed in the Ministry of Food and Agriculture.

Need for central staff to carry out milk

With regard to the relative suitability of roller-drying and spray-drying plants under India conditions, the Committee think that plants of both the kinds have their place, the choice depending upon the availability of milk and finances and the usage of milk powder in view. Roller-drying should be adopted where the quantity of milk available is less than 300 mds. per day or where skim milk, butter milk or whey are to be dried for use as animal food or for manufacturing purposes. Baby foods can also be manufactured by that process. But spray-drying must be adopted where dried milk is to be reconstituted for use on table.

Relative suitability of roller-drying and spray-drying plants

Little research work has so far been carried out in the condensing and drying of milk, produced by Indian cows and buffaloes at different times of the year. Many problems in this field have, therefore, remained unsolved. These must be tackled if the country is to have an industry which is organised on sound lines. The Committee, therefore, recommend that the National Dairy Research Institute, Karnal should pay special attention to a study of these problems and should undertake manufacture of evaporated, condensed, malted and dried milks on pilot plant scale, using cow and buffalo milk produced at different times of the year. The plant required for this purpose, the Committee note, is already in possession of the Institute.

Need for research

The equipment required for a modern milk condensery or drying plant is both varied and complicated. But little of that is manufactured within the country at present. The Committee recommend that the requirements of such equipment (as also equipment for milk treatment plants) over the next

Need for indigenous manufacture of dairy equipment

5-7 years should be assessed and steps taken to organise its manufacture by private trade or in a plant which may come up in the public sector. They feel that the private trade is likely to show interest if assured of a good demand over a period and suggest that negotiations should be undertaken for this purpose first with the four Indian firms of dairy engineers, who represent some reputed overseas manufactures. If these prove of no avail, indigenous manufacturers of allied equipment should be induced to take up manufacture under licence from overseas manufacturers, who are not represented in India. But if even that fails, a factory should be put up in the public sector. The Committee wish to emphasise that in the context of the country's current foreign exchange difficulties, which may continue for some years, indigenous manufacture of the required plant and machinery is an essential prerequisite to the development of an organised dairy industry, be it for supply market milk or for condensed and dried milks. They, therefore, hope that the matter will be given the prompt attention it deserves in the interest of national health and well being.

(Sd.) KRISHAN CHAND,
2nd December, 1958.

(Sd.) L. C. SIKKA,
2nd December, 1958.

(Sd.) V. A. MEHTA,
2nd December, 1958.



MINISTRY OF COMMERCE AND INDUSTRY

New Delhi, the 12th March, 1959.

RESOLUTION

No. 19(3)/57-CH(II).—By their Resolution No. 19(3)/57-C.D.A.(MCI), dated the 19th February, 1957, the Government of India appointed a Committee to review the development of Milk Powder and condensed milk industry in India and to make recommendations about its development. The Committee was also required to make recommendations regarding indigenous fabrication of milk powder plants. The terms of reference of the Committee were as follows:—

- (i) To review the steps so far taken to develop the milk powder industry in India in the private and public sectors and also under the auspices of the UNICEF.
- (ii) To assess the scope for further development of the production of milk powder in India having regard to the present and potential availability of fluid milk and to suggest suitable locations for this purpose.
- (iii) To assess (a) present import; (b) indigenous production and (c) consumption of milk powder in India for different purposes.
- (iv) To make recommendations regarding the nature of plant and machinery required for the manufacture of milk powder keeping in view the present foreign exchange position and to examine the scope for the fabrication of roller and spray milk drying plants in India in the near future.
- (v) To make such other recommendations that the Committee may deem appropriate having regard to the objective of developing the production of milk powder in India.
- (vi) The Committee may also make an inquiry on the above lines in regard to 'condensed milk.

2. The Committee submitted its report on the 11th December, 1958 and its main recommendations are:—

- (i) A well organised indigenous milk condensing and drying industry should be established as speedily as possible not only to meet the requirements of condensed, evaporated and dried milk but also to provide a remunerative outlet.

for surplus milk available in certain areas which is not being marketed very profitably at present. This step would add to rural prosperity.

- (ii) In selecting locations for milk manufacturing plants the fluid milk requirement, present or future, of large consuming centres should not be lost sight of. In fact, these requirements should be satisfied first and only surplus milk not required for liquid consumption should be used for manufacturing purposes and, wherever possible, a milk products factory should be equipped to handle market milk as well.
- (iii) To make the country self-sufficient in infant milk foods and whole milk powder, both of which are required for consumption by priority consumers preference should be given to the manufacture of these products rather than butter/ghee and skim milk powder, both in the existing plants and the new plants coming up in the public and private sectors.
- (iv) Due to lack of care exercised in the production of milk under Indian conditions, it gets heavily contaminated with bacteria which reduces its keeping quality. In order to avoid such contamination, milk should be produced hygienically and extension work should be undertaken by competent technical staff.
- (v) Extension service is necessary to increase and intensify milk production in the selected areas. The extension work should consist of organisation of producers' co-operatives to market milk and to arrange supply of feed, fodder, fertiliser, etc. Special staff necessary for this purpose should be employed by the State Governments concerned.
- (vi) Priority should be given by the States concerned for providing a net-work of all weather roads for the transport of milk from the rural areas to milk processing plants.
- (vii) The question of indigenous manufacture of dairy equipment should be examined speedily by the Ministry of Commerce and Industry in collaboration with the Ministry of Food and Agriculture and foreign exchange necessary for plants which cannot be fabricated indigenously should be released so that the projected milk powder plants in the second five year plan may come up speedily.
- (viii) Milk surveys should be carried out in existing milk pockets in different parts of the country. The results of these surveys would be helpful in implementing the schemes for the development of milk powder industry both in the public as well as private sectors. In the opinion of the

Committee there are many areas in Andhra Pradesh, Bihar, Bombay, Madras, Mysore, Madhya Pradesh, Uttar Pradesh and Punjab where milk powder and milk condensing plants can be set up. This should, however, be confirmed by carrying out detailed milk surveys, and a definite plan prepared as early as possible for the establishment of milk powder plants in different parts of the country during the next 5 to 7 years. The plan should also indicate which particular area would be best suited for the location of condensed milk plants, roller drying or spray drying plants. It would be desirable to entrust the work of carrying out milk survey to the Central Staff employed in Ministry of Food & Agriculture.

- (ix) Both roller drying as well as spray drying plants have their utility. The choice would depend upon the availability of milk, finances and the usage of milk powder in future. Roller drying should be adopted where the quantity of milk available is less than 300 maunds per day or where skim milk, butter milk or whey are to be dried for use as animal feed or for manufacturing purposes. Baby foods can also be manufactured by roller drying process. Spray drying should be adopted where dried milk is to be reconstituted for use on the table.
- (x) The National Dairy Research Institute, Karnal should pay special attention to the study of condensing and drying of milk produced by Indian cows and buffaloes at different times of the year.

3. The Government of India after careful consideration of these recommendations have accepted (i) to (iv), (v) and (vii) to (x) mentioned in paragraph 2 above and will take steps to implement them as far as possible. Recommendation Nos. (v) and (vi) are commended to the consideration of the State Governments.

ORDER

Ordered that a copy of the Resolution be communicated to all concerned and that it may be published in the Gazette of India.

B. B. SAKSENA,
Joint Secretary to the Government of India.